PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-263182
(43)Date of publication of application : 19.09.2003

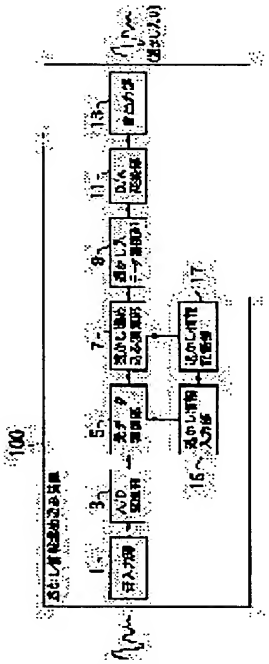
(51)Int.Cl. G10L 11/00
G09C 5/00
G10K 15/02

(21)Application number : 2002-062556
(22)Date of filing : 07.03.2002

(71)Applicant : NIPPON TELEGRAPH & TELEPHONE EAST CORP
(72)Inventor : ITO HARUHISA

(54) METHOD FOR EMBEDDING WATERMARK INFORMATION, ITS DEVICE, WATERMARK INFORMATION EMBEDDING PROGRAM, AND COMPUTER READABLE RECORDING MEDIUM HAVING THE PROGRAM RECORDED THEREON

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a watermark embedding method and device capable of embedding electronic watermark information in an inputted sound and outputting the sound with the embedded electronic watermark information, a watermark information embedding program, and a computer readable recording medium having the program recorded thereon.
SOLUTION: An inputted acoustic signal is converted into a digital signal, and the digital signal is divided with a previously set time interval and temporarily stored. Previously stored electronic watermark information is embedded in the digital signals divided with each time interval by applying prescribed arithmetic operations and a watermark-including digital signal having the electronic watermark information embedded therein is converted into a sound for output.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

BEST AVAILABLE COPY

[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The watermark information embedding approach characterized by the thing to which it was the watermark information embedding approach when embedding digital-watermarking information in a sound, and the computer digitized the inputted sound, the digital signal was generated, and it was beforehand set to this digital signal, and for which digital-watermarking information is embedded one by one for every time interval.
[Claim 2] The step from which it is the watermark information embedding approach when embedding digital-watermarking information in a sound, and a computer changes the information about the inputted sound into an analog signal, The step which changes said analog signal into a digital signal, and the step which memorizes said digital signal temporarily for every time interval set up beforehand, The step which embeds the digital-watermarking information which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, The step where said digital-watermarking information was embedded and which spaces and memorizes an entering digital signal temporarily, The watermark information embedding approach characterized by performing said step which spaces, spaces an entering digital signal and is changed into an entering analog signal, and said step which spaces, and changes and outputs an entering analog signal to a sound.
[Claim 3] Said digital-watermarking information is the watermark information embedding approach according to claim 1 or 2 characterized by being equally embedded one by one to the digital signal of each time zone divided for said every time interval.
[Claim 4] The watermark information embedding approach according to claim 1 or 2 characterized by embedding periodically said digital-watermarking information divided into two or more parts one by one to the digital signal of each time zone divided for said every time interval.

[Claim 5] Said digital-watermarking information is the watermark information embedding approach according to claim 1 or 2 characterized by being intermittently embedded to the digital signal of each time zone divided for said every time interval.
[Claim 6] Said digital-watermarking information is claim 1 characterized by consisting of one or more alphabetic characters thru/or the watermark information embedding approach of five given in any 1 term.
[Claim 7] Watermark information embedding equipment characterized by having a digitization means to be watermark information embedding equipment when embedding digital-watermarking information in a sound, and to digitize the inputted sound and to generate a digital signal, and the watermark embedding operation means which was beforehand set up to said digital signal, and which embeds digital-watermarking information one by one for every time interval.
[Claim 8] A sound input means to be watermark information embedding equipment which embeds digital-watermarking information in a sound, and to change the information about the inputted sound into an analog signal, A digitization means to change said analog signal into a digital signal, and a former data accumulation means to divide said digital signal with the time interval set up beforehand, and to memorize it temporarily, A watermark information input means to input said digital-watermarking information, and a watermark information storage means to memorize said

digital-watermarking information inputted with said watermark information input means, The watermark embedding operation means which embeds said digital-watermarking information memorized by said watermark information storage means by the predetermined operation to the digital signal divided for said every time interval, A data accumulation means containing a watermark for said digital-watermarking information to have been embedded and to space and to memorize an entering digital signal temporarily, Watermark information embedding equipment characterized by having said analog-ized means to space, to space an entering digital signal and to change into an entering analog signal, and said sound output means to space, and to change and output an entering analog signal to a sound.

[Claim 9] Said watermark embedding operation means is watermark information embedding equipment according to claim 7 or 8 characterized by reading the digital-watermarking information memorized by said watermark information storage means, and embedding this digital-watermarking information equally one by one to the digital signal of each time zone divided into said time interval.

[Claim 10] Said watermark embedding operation means is watermark information embedding equipment according to claim 7 or 8 characterized by reading the digital-watermarking information memorized by said watermark information storage means, dividing into two or more parts, and embedding periodically each part of this divided digital-watermarking information one by one to the digital signal of each time zone divided with said time interval.

[Claim 11] Said watermark embedding operation means is watermark information embedding equipment according to claim 7 or 8 characterized by reading the digital-watermarking information memorized by said watermark information storage means, and embedding this digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.

[Claim 12] Said digital-watermarking information is claim 7 characterized by consisting of one or more alphabetic characters thru/or watermark information embedding equipment of 11 given in any 1 term.

[Claim 13] The watermark information embedding program characterized by considering as a digitization means to digitize the sound into which the computer was inputted in order to embed digital-watermarking information in a sound, and to generate a digital signal, and the watermark embedding operation means which was beforehand set up to said digital signal, and which embeds digital-watermarking information one by one for every time interval, and making it function.

[Claim 14] A sound input means to change into an analog signal the information about the sound into which the computer was inputted in order to embed digital-watermarking information in a sound, A digitization means to change said analog signal into a digital signal, a former data accumulation means to divide said digital signal with the time interval set up beforehand, and to memorize it temporarily, A watermark information input means to input said digital-watermarking information, a watermark information storage means to memorize said digital-watermarking information inputted with said watermark information input means, The watermark embedding operation means which embeds said digital-watermarking information memorized by said watermark information storage means by the predetermined operation to the digital signal divided for said every time interval, A data accumulation means containing a watermark for said digital-watermarking information to have been embedded and to space and to memorize an entering digital signal temporarily, Said analog-ized means to space, to space an entering digital signal and to change into an entering analog signal, the watermark information embedding program which spaces and is characterized by considering as said sound output means to change and output an entering analog signal to a sound, and making it function.

[Claim 15] Said watermark embedding operation means is a watermark information embedding program according to claim 13 or 14 characterized by reading the digital-watermarking information memorized by said watermark information storage means, and embedding this digital-watermarking information equally one by one to the digital signal of each time zone divided into said time interval.

[Claim 16] Said watermark embedding operation means is a watermark information embedding

program according to claim 1[redacted]14 characterized by reading the digital[redacted]watermarking information memorized by said watermark information storage means, dividing into two or more parts, and embedding periodically each part of this divided digital-watermarking information one by one to the digital signal of each time zone divided with said time interval.
[Claim 17] Said watermark embedding operation means is a watermark information embedding program according to claim 13 or 14 characterized by reading the digital-watermarking information memorized by said watermark information storage means, and embedding this digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.
[Claim 18] Said digital-watermarking information is the watermark information embedding program of 17 claim 13 characterized by consisting of one or more alphabetic characters thru/or given in any 1 term.
[Claim 19]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the record medium which recorded the watermark information embedding approach which embeds digital-watermarking information in a sound, watermark information embedding equipment, the watermark information embedding program, and the program concerned and in which computer reading is possible.
[0002]
[Description of the Prior Art] Conventionally, digital-watermarking information ("digital watermarking" may only be called henceforth) is embedded at the music content distributed through the Internet, and the technique which can clarify the owner of rights, such as copyright concerning the music content and neighboring right, is indicated.
[0003]
[Problem(s) to be Solved by the Invention] However, since off-line processing was carried out to the file stored in a means to memorize data, such as a disk and memory, beforehand, the conventional technique mentioned above was not able to be applied like [at the time of a live performance in a concert etc.] to embed digital watermarking on real time at a performance and coincidence.
[0004] For this reason, at the concert hall, in order to protect copyright and a player's neighboring right, in spite of having forbidden carrying in of a sound recorder machine, the present condition was that there is no measure adopted to the performance sound which is recorded unjustly and distributed through the Internet etc. at the time of a live performance.
[0005] This invention is made in view of the above, and the purpose is to offer the record medium which recorded the watermark information embedding approach which can output the sound where the digital-watermarking information was embedded, watermark information embedding equipment, the watermark information embedding program, and the program concerned and in which computer reading is possible at the same time it embeds digital-watermarking information in the inputted sound.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, let the thing to which this invention according to claim 1 was the watermark information embedding approach when embedding digital-watermarking information in a sound, the computer digitized the inputted sound, the digital signal was generated, and it was beforehand set to this digital signal and for which digital-watermarking information is embedded one by one for every time interval be a summary.
[0007] According to this invention according to claim 1, it becomes possible to embed digital watermarking on real time by [to which it was beforehand set to the digital signal which digitized the inputted sound] embedding digital watermarking one by one for every time interval.
[0008] The step from which this invention according to claim 2 is the watermark information embedding approach when embedding digital-watermarking information in a sound, and a computer changes the information about the inputted sound into an analog signal, The step which changes said analog signal into a digital signal, and the step which divides said digital signal

with the time interval set up beforehand, and memorizes it temporarily, The step which embeds the digital-watermarking information which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, The step where said digital-watermarking information was embedded and which spaces and memorizes an entering digital signal temporarily, It spaces and let it be a summary to perform said step which spaces, spaces an entering digital signal and is changed into an entering analog signal, and said step which changes and outputs an entering analog signal to a sound.

[0009] According to this invention according to claim 2, a computer changes the inputted sound into a digital signal, and this digital signal is temporarily memorized after division with the time interval set up beforehand. After embedding digital watermarking which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, by [which space, and changes and outputs an entering digital signal to a sound] having embedded the digital watermarking It becomes possible to embed and output digital watermarking to the inputted sound on real time.

[0010] This invention according to claim 3 makes it a summary to embed said digital-watermarking information equally one by one to the digital signal of each time zone divided for said every time interval.

[0011] According to this invention according to claim 3, the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by embedding digital watermarking equally one by one to each part of the divided digital signal.

[0012] This invention according to claim 4 makes it a summary to embed periodically said digital-watermarking information divided into two or more parts one by one to the digital signal of each time zone divided for said every time interval.

[0013] According to this invention according to claim 4, the information embedded as digital watermarking can be divided into two or more parts, and the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by embedding each of this divided part periodically one by one to the divided digital signal.

[0014] This invention according to claim 5 makes it a summary to embed said digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.

[0015] According to this invention according to claim 5, the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by preparing intermittently the time zone which embeds digital-watermarking information, and the time zone which is not embedded.

[0016] This invention according to claim 6 makes it a summary for said digital-watermarking information to consist of one or more alphabetic characters.

[0017] According to this invention according to claim 6, using a character string as digital watermarking, this character string can be changed suitably and it can embed at a digital signal.

[0018] This invention according to claim 7 is watermark information embedding equipment when embedding digital-watermarking information in a sound, and makes it a summary to have had a digitization means to digitize the inputted sound and to generate a digital signal, and the watermark embedding operation means which was beforehand set up to said digital signal and which embeds digital-watermarking information one by one for every time interval.

[0019] According to this invention according to claim 7, it becomes possible to embed digital watermarking on real time by [to which it was beforehand set to the digital signal which digitized the inputted sound] embedding digital watermarking one by one for every time interval.

[0020] A sound input means for this invention according to claim 8 to be watermark information embedding equipment which embeds digital-watermarking information in a sound, and to change the information about the inputted sound into an analog signal, A digitization means to change said analog signal into a digital signal, and a former data accumulation means to divide said digital signal with the time interval set up beforehand, and to memorize it temporarily, A watermark information input means to input said digital-watermarking information, and a watermark

information storage means to memorize said digital-watermarking information inputted with said watermark information input means, The watermark embedding operation means which embeds said digital-watermarking information memorized by said watermark information storage means by the predetermined operation to the digital signal divided for said every time interval, A data accumulation means containing a watermark for said digital-watermarking information to have been embedded and to space and to memorize an entering digital signal temporarily, Let it be a summary to have had said analog-ized means to space, to space an entering digital signal and to change into an entering analog signal, and said sound output means to have spaced, and to change and output an entering analog signal to a sound.

[0021] According to this invention according to claim 8, change the inputted sound into a digital signal and this digital signal is temporarily memorized after division with the time interval set up beforehand. After embedding digital watermarking which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, by [which space, and changes and outputs an entering digital signal to a sound] having embedded digital watermarking The watermark information embedding equipment which can embed and output digital watermarking to the inputted sound on real time can be offered.

[0022] This invention according to claim 9 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information equally one by one to the digital signal of each time zone divided into said time interval.

[0023] According to this invention according to claim 9, the sound containing digital watermarking can be outputted with the time of sound generating by embedding digital watermarking equally with a watermark embedding operation means to each part of the divided digital signal that there is almost no time difference.

[0024] Said watermark embedding operation means reads the digital-watermarking information memorized by said watermark information storage means, and this invention according to claim 10 divides it into two or more parts, and makes it a summary to embed periodically each part of this divided digital-watermarking information one by one to the digital signal of each time zone divided with said time interval.

[0025] According to this invention according to claim 10, the information embedded as digital watermarking using a watermark information embedding operation means can be divided into two or more parts, and the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by embedding each of this divided part periodically one by one at the divided digital signal.

[0026] This invention according to claim 11 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.

[0027] According to this invention according to claim 11, the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by preparing intermittently the time zone which embeds digital-watermarking information, and the time zone which is not embedded.

[0028] This invention according to claim 12 makes it a summary for said digital-watermarking information to consist of one or more alphabetic characters.

[0029] According to this invention according to claim 12, using a character string as digital watermarking, this character string can be changed suitably and it can embed at a digital signal.

[0030] Hereafter, this invention according to claim 13 to 18 offers the watermark information embedding program for making a computer perform the watermark information embedding approach which embeds digital watermarking in a sound.

[0031] This invention according to claim 13 makes it a summary to consider as a digitization means to digitize the sound into which the computer was inputted and to generate a digital signal, and the watermark embedding operation means which was beforehand set up to said digital signal and which embeds digital-watermarking information one by one for every time interval, and to make it function, in order to embed digital-watermarking information in a sound.

[0032] According to this invention according to claim 13, the watermark information embedding program which makes it possible to embed digital watermarking on real time can be offered by [to which it was beforehand set to the digital signal which digitized the inputted sound] embedding digital watermarking one by one for every time interval.
[0033] In order that this invention according to claim 14 may embed digital-watermarking information in a sound, a computer A sound input means to change the information about the inputted sound into an analog signal, a digitization means to change said analog signal into a digital signal, A former data accumulation means to divide said digital signal with the time interval set up beforehand, and to memorize it temporarily, A watermark information input means to input said digital-watermarking information, a watermark information storage means to memorize said digital-watermarking information inputted with said watermark information input means, The watermark embedding operation means which embeds said digital-watermarking information memorized by said watermark information storage means by the predetermined operation to the digital signal divided for said every time interval, A data accumulation means containing a watermark for said digital-watermarking information to have been embedded and to space and to memorize an entering digital signal temporarily, Let it be a summary to consider as said analog-ized means to space, to space an entering digital signal and to change into an entering analog signal, and said sound output means to space, and to change and output an entering analog signal to a sound, and to make it function.
[0034] According to this invention according to claim 14, change the inputted sound into a digital signal and this digital signal is temporarily memorized after division with the time interval set up beforehand. After embedding digital watermarking which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, by [which space, and changes and outputs an entering digital signal to a sound] having embedded the digital watermarking The watermark information embedding program which can embed and output digital watermarking to the inputted sound on real time can be offered.
[0035] This invention according to claim 15 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information equally one by one to the digital signal of each time zone divided into said time interval.
[0036] According to this invention according to claim 15, the time of sound generating and the program which outputs the sound containing digital watermarking that there is almost no time difference can be offered by embedding digital watermarking equally one by one to each part of the divided digital signal.
[0037] Said watermark embedding operation means reads the digital-watermarking information memorized by said watermark information storage means, and this invention according to claim 16 divides it into two or more parts, and makes it a summary to embed periodically each part of this divided digital-watermarking information one by one to the digital signal of each time zone divided with said time interval.
[0038] According to this invention according to claim 16, the information embedded as digital watermarking can be divided into two or more parts, and the time of sound generating and the program which outputs the sound containing digital watermarking that there is almost no time difference can be offered by embedding each of this divided part periodically one by one at the divided digital signal.
[0039] This invention according to claim 17 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.
[0040] According to this invention according to claim 17, the time of sound generating and the program which outputs the sound containing digital watermarking that there is almost no time difference can be offered by preparing intermittently the time zone which embeds digital-watermarking information, and the time zone which is not embedded.
[0041] This invention according to claim 18 makes it a summary for said digital-watermarking information to consist of one or more alphabetic characters.

[0042] According to this invention according to claim 18, the program which changes this character string suitably and is embedded at a digital signal can be offered, using a character string as digital watermarking.
[0043] This invention according to claim 19 makes it a summary to have recorded the watermark information embedding program of 18 claim 13 thru/or given in any 1 term.
[0044] According to this invention according to claim 19, the record medium which recorded the watermark information embedding program of 18 claim 13 thru/or given in any 1 term and in which computer reading is possible can be offered.
[0045]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[0046] Drawing 1 is a block diagram showing the configuration of the watermark information embedding equipment 100 concerning 1 operation gestalt of this invention. The watermark information embedding equipment 100 shown in this drawing The sound generated at the time of a performance An electrical signal The sound input section 1 changed into a (analog signal), the A/D-conversion section 3 which digitizes the analog signal inputted from this sound input section 1, the former data accumulation section 5 which memorizes temporarily the digital signal digitized in the A/D-conversion section 3 for every time interval set up beforehand, To said digital signal, digital watermarking The watermark embedding operation part 7 to embed, the data accumulation section 9 containing a watermark which memorizes temporarily the digital signal with which digital watermarking was embedded, the D/A transducer 11 which spaces and changes an entering digital signal into an analog signal, and the analog signal containing a watermark are changed into a sound. It has the sound output section 13 to output at least.
[0047] Watermark information embedding equipment 100 has the watermark information input section 15 which sets up the time interval which divides a digital signal in the former data accumulation section 5, and the watermark information storage section 17 which memorizes digital watermarking, spaces the data and transmits to the embedding operation part 7 while inputting further digital watermarking embedded at a digital signal.
[0048] A character string is mentioned as an example of digital watermarking inputted in the watermark information input section 15. As long as this character string includes the proper information for identifying a sound, what inputted the desired character string suitably is sufficient as it, and the random number generated using the random number generator etc. is sufficient as it. When thinking the real time nature of the sound outputted as important, the direction with little amount of information of digital watermarking is more desirable. Therefore, if a sound can be specified even if it is a metaphor single character, using as digital watermarking is possible.
[0049] Moreover, the sound of a suitable frequency, for example, the sound which carries out localization to the frequency domain of extent which cannot be sensed with human being's consciousness, can be inputted from the watermark information input section 15, and this sound can also be made into digital watermarking.
[0050] The case where it has the configuration to which the body part which changes from other each part to the sound input sections 1, such as a microphone, and the sound output sections 13, such as a loudspeaker, as a gestalt of watermark information embedding equipment 100 was connected can be considered.
[0051] Moreover, it is possible to also make the configuration mentioned above to the electrohone like an electronic organ, an electric guitar, and an electronic violin itself as another gestalt of watermark information embedding equipment 100 provide. In this case, digital watermarking will be embedded and outputted to the sound performed with electrohone from the start.
[0052] In addition, the watermark information embedding equipment 100 which has the above configuration consists of computers equipped with a central processing unit, main memory, etc., and the watermark information embedding program for performing processing explained below is memorized. Moreover, this program is also recordable on the record medium which CD-ROM etc. can computer read.

[0053] Drawing 2 is an explanatory view showing the flow of processing of the watermark information embedding approach concerning this operation gestalt, and change of the signal in each processing. In this drawing, the signal Fig. in which the acoustic signal according to the step corresponding to the right-hand side of each step of a flow chart showed what kind of thing it was is given. Hereafter, it spaces using drawing 2 and the flow of processing of the watermark information embedding approach by information embedding equipment 100 is explained.
[0054] The sound emitted at the time of a performance is inputted in the sound input section 1, it changes into an electrical signal (analog signal) (step S1), and this electrical signal (analog signal) is changed into a digital signal by the A/D-conversion section 3 (step S3). Although the case (hex decimal) where it displays 4 bits of digital signals at a time collectively as an example is given in drawing 2 , this operation gestalt may not be restricted to this and may be made the display by the mere binary numeral (010011 ...).
[0055] At the following step S5, the above-mentioned digital signal is serially accumulated in the constant-rate [every] former data accumulation section 5. In the case of are recording here, with the time interval (T of drawing 2) beforehand set up by the watermark information input section 15, a digital signal is divided and it accumulates a constant rate every serially. Although the case where a digital signal is divided into every 9 figure (36 bits) is expressed with the example of drawing 2 , of course, this is only an example to the last.
[0056] Although the value of a time interval T can be adjusted suitably, it is desirable to set up the value of extent which human being cannot perceive time difference, i.e., the value of extent which does not spoil real time nature.
[0057] After embedding digital-watermarking information by the watermark embedding operation part 7 at the digital signal of the former data stored at step S5 (step S7), it memorizes temporarily in the watermark close data accumulation section 9.
[0058] After digital watermarking by the watermark embedding operation part 7 embedding, and changing suitably digital watermarking which developed the digital signal by the fast Fourier transform (or discrete cosine transform), for example, changed into the frequency component as a direction, spaced through the specific frequency component of these, and was memorized in the information storage section 17 and embedding it, there is a method of returning to a digital signal by the reverse fast Fourier transform (or reverse discrete cosine transform).
[0059] Moreover, besides what was mentioned above, wavelet transform may be used, and you may change into a frequency component, and may also embed digital watermarking.
[0060] Furthermore, it is also possible to carry out spectrum diffusion and to embed at each frequency component of the digital signal which generated the random number based on normal distribution, and was changed by the operation of one of the above by making this random number into digital watermarking.
[0061] In addition, as for digital watermarking used with the watermark information embedding equipment 100 concerning this operation gestalt, it is desirable to mainly be embedded into the redundancy part which is not human being's consciousness overlay important point in the generated sound, and not to perceive the digital watermarking as a noise after an output. Therefore, it is more desirable to set up so that it may increase relatively compared with the amount of digital watermarking which embeds the amount of digital watermarking embedded into a redundancy part into the main frequency part which human being can perceive by the watermark embedding operation part 7.
[0062] The signal Fig. shown after step S9 of drawing 2 shows the case where a part of character string receives modification, as a result of digital watermarking's being embedded by a certain operation mentioned above. the result by which digital watermarking was more specifically embedded at the digital signal "17DF7AC7B" in the first time interval T — "A" of "7" and the left of the left to the double figures to the 6th figure — a value "8" respectively big [every / 1] and "B" — changing — "B" of the left to the 9th (digit of most right end) figure — 1 — it is changing to the small value "A." Also about future time intervals, the value for triple figures is increasing or decreasing every [1] among 9 figures, respectively.
[0063] After that, by the D/A transducer 11, the digital signal containing a watermark with which digital watermarking was embedded is changed into an analog signal (step S11), and is outputted

as a sound containing digital watermarking from the sound output section 13 (step S13).
[0064] What embedded digital watermarking in the performed sound can be outputted on real time as a result of the above processing.
[0065] According to 1 operation gestalt of this invention mentioned above, the digital signal which digitized the inputted sound is accumulated a constant rate every serially, and it becomes possible by embedding digital watermarking for every constant rate of this to output the sound containing digital watermarking to coincidence mostly with generating of the original sound.
[0066] Moreover, according to this operation gestalt, right information, such as copyright concerning the music content, can be specified by carrying out unjust sound recording at the time of a live performance, and analyzing digital watermarking embedded to the music content distributed through the Internet etc.
[0067] Furthermore, according to this operation gestalt, digital watermarking is already contained in the sound performed at the time before concert initiation, and the effectiveness which controls unjust sound recording can be expected by notifying of the purport punished on the Copyright Act, when the contents recorded unjustly are exhibited by the Internet.
[0068] In addition, in 1 operation gestalt of this invention mentioned above, although the case where digital watermarking was equally embedded to all the digital signals that were set up beforehand and that were divided for every time interval was explained, this invention does not do effectiveness peculiar to a limitation so to how to embed such digital watermarking.
[0069] Hereafter, as a modification of this operation gestalt, it spaces and the same digital watermarking as the information embedding approach is spaced, it inputs from the information input section 15, and the case where the time interval which divides the digitized signal which was mentioned above is also set as the value of the same T is explained.
[0070] Drawing 3 is an explanatory view in case how to embed digital watermarking of each divided time interval differs periodically. In this drawing, the configuration of watermark information embedding equipment is the same as drawing 1 , and the flow of processing of the watermark information embedding equipment is the same as drawing 2 .
[0071] Although the point which embeds digital watermarking one by one in the time zone divided with the time interval T is the same as that of drawing 2 when shown in drawing 3 , in drawing 2 , only the signal for a single figure is changed with each time interval to the signal for triple figures having been changed with one time interval here. namely, — digital watermarking — embedding — having had — a result — the — one — a time zone — **** — the left — from — two — a figure — ** — only — (— "— seven — " — -> — "— eight — " —) — the — two — a time zone — **** — the left — from — six — a figure — ** — only — (— "— F — " — -> — "— E — " —) — the — three — a time zone — **** — the left — from — eight — a figure — ** — only — (— "— E — " — -> — "— F — " —) — respectively — a value — modification — winning popularity — **** . Thus, in case digital watermarking of the same amount of data as drawing 2 was embedded, because the information beforehand embedded as digital watermarking by the watermark embedding operation part 7 was divided and each of that divided part was embedded one by one, it decreased rather than the case where the digit count changed with each time interval shows drawing 2 .
[0072] Temporarily, by the 3rd time zone, supposing the whole of each part divided from the information embedded as digital watermarking is embedded, like the 1st thru/or the 3rd time zone, said each part is embedded one by one, and it will be henceforth embedded periodically one by one considering three time zones as one period after the 4th time zone.
[0073] In addition, it cannot be overemphasized that the explanatory view shown in drawing 3 expresses an example in the case of embedding periodically digital watermarking divided beforehand one by one.
[0074] Drawing 4 is an explanatory view showing the flow of processing at the time of setting up so that the time zone which embeds digital watermarking, and the time zone which is not embedded may come by turns, and the situation of change of a signal. Also in this drawing, the flow of the configuration of watermark information embedding equipment and processing is the same as drawing 1 and drawing 2 respectively.
[0075] when shown in drawing 4 , in the 1st time zone, digital watermarking is embedded like

drawing 2 — **** (3 and the value of the 6 or 9th figure are one increment or reduction from the left) — digital watermarking is not embedded in the 2nd time zone. Henceforth, a signal without entering digital watermarking and digital watermarking comes to come by turns. In addition, it can also set up so that the time zone which embeds digital watermarking may become random.

[0076] Moreover, of course, it is also possible to make it digital watermarking to embed change periodically, after setting up suitably the time zone which embeds digital watermarking after dividing a digital signal into a suitable time interval by combining how embedding digital watermarking shown in drawing 3 and drawing 4 .

[0077] According to the modification of 1 operation gestalt of this invention explained using drawing 3 and drawing 4 , it cannot be overemphasized that the same effectiveness as the above-mentioned operation gestalt is acquired.

[0078] In addition, especially the thing that the modification mentioned above makes the same digital watermarking and the time interval T to divide, and delay produces in actuation of a musical instrument and the sound which are outputted like [since there is little amount of data of digital watermarking embedded in each time zone divided as compared with the case where it is shown in drawing 2 and it ends] the concert held at the small hall of a scale etc. is not allowed, but does bigger effectiveness so to the case want to think real-time nature as important as much as possible etc.

[0079] As stated above, in this invention, the amount of data of digital watermarking embedded in the time interval T which divides a digital signal, and each time zone can be adjusted to the optimal thing each time according to a scale, a performance gestalt, etc. in the performance hall.

[0080]

[Effect of the Invention] While embedding digital-watermarking information in the inputted sound according to this invention explained above, the record medium which recorded the watermark information embedding approach which can output the sound where the digital-watermarking information was embedded, watermark information embedding equipment, the watermark information embedding program, and the program concerned and in which computer reading is possible can be offered.

[0081] Moreover, since according to this invention the digital-watermarking information which identifies the music content currently performed on real time can be beforehand specified as a character string and the specified character string can be embedded as digital-watermarking information at the music content itself, when the music content by which unjust sound recording was carried out is distributed through the Internet etc., right information, such as copyright which starts the music content based on the embedded digital-watermarking information, can be specified.

[0082] Furthermore, according to this invention, unjust distribution of the music content recorded [which recorded and inaccurate-recorded] at the time of a concert performance can be inhibited by [which were mentioned above in advance of the concert] spacing and performing the notice about an information embedding function.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the record medium which recorded the watermark information embedding approach which embeds digital-watermarking information in a sound, watermark information embedding equipment, the watermark information embedding program, and the program concerned and in which computer reading is possible.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] Conventionally, digital-watermarking information ("digital watermarking" may only be called henceforth) is embedded at the music content distributed through the Internet, and the technique which can clarify the owner of rights, such as copyright concerning the music content and neighboring right, is indicated.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] While embedding digital-watermarking information in the inputted sound according to this invention explained above, the record medium which recorded the watermark information embedding approach which can output the sound where the digital-watermarking information was embedded, watermark information embedding equipment, the watermark information embedding program, and the program concerned and in which computer reading is possible can be offered.
[0081] Moreover, since according to this invention the digital-watermarking information which identifies the music content currently performed on real time can be beforehand specified as a character string and the specified character string can be embedded as digital-watermarking information at the music content itself, when the music content by which unjust sound recording was carried out is distributed through the Internet etc., right information, such as copyright which starts the music content based on the embedded digital-watermarking information, can be specified.
[0082] Furthermore, according to this invention, unjust distribution of the music content recorded [which recorded and inaccurate-recorded] at the time of a concert performance can be inhibited by [which were mentioned above in advance of the concert] spacing and performing the notice about an information embedding function.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since off-line processing was carried out to the file stored in a means to memorize data, such as a disk and memory, beforehand, the conventional technique mentioned above was not able to be applied like [at the time of a live performance in a concert etc.] to embed digital watermarking on real time at a performance and coincidence.
[0004] For this reason, at the concert hall, in order to protect copyright and a player's neighboring right, in spite of having forbidden carrying in of a sound recorder machine, the present condition was that there is no measure adopted to the performance sound which is recorded unjustly and distributed through the Internet etc. at the time of a live performance.
[0005] This invention is made in view of the above, and the purpose is to offer the record medium which recorded the watermark information embedding approach which can output the sound where the digital-watermarking information was embedded, watermark information embedding equipment, the watermark information embedding program, and the program concerned and in which computer reading is possible at the same time it embeds digital-watermarking information in the inputted sound.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, let the thing to which this invention according to claim 1 was the watermark information embedding approach when embedding digital-watermarking information in a sound, the computer digitized the inputted sound, the digital signal was generated, and it was beforehand set to this digital signal and for which digital-watermarking information is embedded one by one for every time interval be a summary.
[0007] According to this invention according to claim 1, it becomes possible to embed digital watermarking on real time by [to which it was beforehand set to the digital signal which digitized the inputted sound] embedding digital watermarking one by one for every time interval.
[0008] The step from which this invention according to claim 2 is the watermark information embedding approach when embedding digital-watermarking information in a sound, and a computer changes the information about the inputted sound into an analog signal, The step which changes said analog signal into a digital signal, and the step which divides said digital signal with the time interval set up beforehand, and memorizes it temporarily, The step which embeds the digital-watermarking information which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, The step where said digital-watermarking information was embedded and which spaces and memorizes an entering digital signal temporarily, It spaces and let it be a summary to perform said step which spaces, spaces an entering digital signal and is changed into an entering analog signal, and said step which changes and outputs an entering analog signal to a sound.
[0009] According to this invention according to claim 2, a computer changes the inputted sound into a digital signal, and this digital signal is temporarily memorized after division with the time interval set up beforehand. After embedding digital watermarking which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, by [which space, and changes and outputs an entering digital signal to a sound] having embedded the digital watermarking It becomes possible to embed and output digital watermarking to the inputted sound on real time.
[0010] This invention according to claim 3 makes it a summary to embed said digital-watermarking information equally one by one to the digital signal of each time zone divided for said every time interval.
[0011] According to this invention according to claim 3, the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by embedding digital watermarking equally one by one to each part of the divided digital signal.
[0012] This invention according to claim 4 makes it a summary to embed periodically said digital-watermarking information divided into two or more parts one by one to the digital signal of each time zone divided for said every time interval.
[0013] According to this invention according to claim 4, the information embedded as digital watermarking can be divided into two or more parts, and the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by embedding each of this divided part periodically one by one to the divided digital

signal.
[0014] This invention according to claim 5 makes it a summary to embed said digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.
[0015] According to this invention according to claim 5, the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by preparing intermittently the time zone which embeds digital-watermarking information, and the time zone which is not embedded.
[0016] This invention according to claim 6 makes it a summary for said digital-watermarking information to consist of one or more alphabetic characters.
[0017] According to this invention according to claim 6, using a character string as digital watermarking, this character string can be changed suitably and it can embed at a digital signal.
[0018] This invention according to claim 7 is watermark information embedding equipment when embedding digital-watermarking information in a sound, and makes it a summary to have had a digitization means to digitize the inputted sound and to generate a digital signal, and the watermark embedding operation means which was beforehand set up to said digital signal and which embeds digital-watermarking information one by one for every time interval.
[0019] According to this invention according to claim 7, it becomes possible to embed digital watermarking on real time by [to which it was beforehand set to the digital signal which digitized the inputted sound] embedding digital watermarking one by one for every time interval.
[0020] A sound input means for this invention according to claim 8 to be watermark information embedding equipment which embeds digital-watermarking information in a sound, and to change the information about the inputted sound into an analog signal, A digitization means to change said analog signal into a digital signal, and a former data accumulation means to divide said digital signal with the time interval set up beforehand, and to memorize it temporarily, A watermark information input means to input said digital-watermarking information, and a watermark information storage means to memorize said digital-watermarking information inputted with said watermark information input means, The watermark embedding operation means which embeds said digital-watermarking information memorized by said watermark information storage means by the predetermined operation to the digital signal divided for said every time interval, A data accumulation means containing a watermark for said digital-watermarking information to have been embedded and to space and to memorize an entering digital signal temporarily, Let it be a summary to have had said analog-ized means to space, to space an entering digital signal and to change into an entering analog signal, and said sound output means to have spaced, and to change and output an entering analog signal to a sound.
[0021] According to this invention according to claim 8, change the inputted sound into a digital signal and this digital signal is temporarily memorized after division with the time interval set up beforehand. After embedding digital watermarking which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, by [which space, and changes and outputs an entering digital signal to a sound] having embedded digital watermarking The watermark information embedding equipment which can embed and output digital watermarking to the inputted sound on real time can be offered.
[0022] This invention according to claim 9 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information equally one by one to the digital signal of each time zone divided into said time interval.
[0023] According to this invention according to claim 9, the sound containing digital watermarking can be outputted with the time of sound generating by embedding digital watermarking equally with a watermark embedding operation means to each part of the divided digital signal that there is almost no time difference.
[0024] Said watermark embedding operation means reads the digital-watermarking information memorized by said watermark information storage means, and this invention according to claim 10 divides it into two or more parts, and makes it a summary to embed periodically each part of this divided digital-watermarking information one by one to the digital signal of each time zone

divided with said time interval.
[0025] According to this invention according to claim 10, the information embedded as digital watermarking using a watermark information embedding operation means can be divided into two or more parts, and the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by embedding each of this divided part periodically one by one at the divided digital signal.
[0026] This invention according to claim 11 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.
[0027] According to this invention according to claim 11, the sound containing digital watermarking can be outputted with the time of sound generating that there is almost no time difference by preparing intermittently the time zone which embeds digital-watermarking information, and the time zone which is not embedded.
[0028] This invention according to claim 12 makes it a summary for said digital-watermarking information to consist of one or more alphabetic characters.
[0029] According to this invention according to claim 12, using a character string as digital watermarking, this character string can be changed suitably and it can embed at a digital signal.
[0030] Hereafter, this invention according to claim 13 to 18 offers the watermark information embedding program for making a computer perform the watermark information embedding approach which embeds digital watermarking in a sound.
[0031] This invention according to claim 13 makes it a summary to consider as a digitization means to digitize the sound into which the computer was inputted and to generate a digital signal, and the watermark embedding operation means which was beforehand set up to said digital signal and which embeds digital-watermarking information one by one for every time interval, and to make it function, in order to embed digital-watermarking information in a sound.
[0032] According to this invention according to claim 13, the watermark information embedding program which makes it possible to embed digital watermarking on real time can be offered by [to which it was beforehand set to the digital signal which digitized the inputted sound] embedding digital watermarking one by one for every time interval.
[0033] In order that this invention according to claim 14 may embed digital-watermarking information in a sound, a computer A sound input means to change the information about the inputted sound into an analog signal, a digitization means to change said analog signal into a digital signal, A former data accumulation means to divide said digital signal with the time interval set up beforehand, and to memorize it temporarily, A watermark information input means to input said digital-watermarking information, a watermark information storage means to memorize said digital-watermarking information inputted with said watermark information input means, The watermark embedding operation means which embeds said digital-watermarking information memorized by said watermark information storage means by the predetermined operation to the digital signal divided for said every time interval, A data accumulation means containing a watermark for said digital-watermarking information to have been embedded and to space and to memorize an entering digital signal temporarily, Let it be a summary to consider as said analog-ized means to space, to space an entering digital signal and to change into an entering analog signal, and said sound output means to space, and to change and output an entering analog signal to a sound, and to make it function.
[0034] According to this invention according to claim 14, change the inputted sound into a digital signal and this digital signal is temporarily memorized after division with the time interval set up beforehand. After embedding digital watermarking which performed the predetermined operation to the digital signal divided for said every time interval, and has been memorized beforehand, by [which space, and changes and outputs an entering digital signal to a sound] having embedded the digital watermarking The watermark information embedding program which can embed and output digital watermarking to the inputted sound on real time can be offered.
[0035] This invention according to claim 15 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark

information storage means, and to embed this digital-watermarking information equally one by one to the digital signal of each time zone divided into said time interval.
[0036] According to this invention according to claim 15, the time of sound generating and the program which outputs the sound containing digital watermarking that there is almost no time difference can be offered by embedding digital watermarking equally one by one to each part of the divided digital signal.
[0037] Said watermark embedding operation means reads the digital-watermarking information memorized by said watermark information storage means, and this invention according to claim 16 divides it into two or more parts, and makes it a summary to embed periodically each part of this divided digital-watermarking information one by one to the digital signal of each time zone divided with said time interval.
[0038] According to this invention according to claim 16, the information embedded as digital watermarking can be divided into two or more parts, and the time of sound generating and the program which outputs the sound containing digital watermarking that there is almost no time difference can be offered by embedding each of this divided part periodically one by one at the divided digital signal.
[0039] This invention according to claim 17 makes it a summary for said watermark embedding operation means to read the digital-watermarking information memorized by said watermark information storage means, and to embed this digital-watermarking information intermittently to the digital signal of each time zone divided for said every time interval.
[0040] According to this invention according to claim 17, the time of sound generating and the program which outputs the sound containing digital watermarking that there is almost no time difference can be offered by preparing intermittently the time zone which embeds digital-watermarking information, and the time zone which is not embedded.
[0041] This invention according to claim 18 makes it a summary for said digital-watermarking information to consist of one or more alphabetic characters.
[0042] According to this invention according to claim 18, the program which changes this character string suitably and is embedded at a digital signal can be offered, using a character string as digital watermarking.
[0043] This invention according to claim 19 makes it a summary to have recorded the watermark information embedding program of 18 claim 13 thru/or given in any 1 term.
[0044] According to this invention according to claim 19, the record medium which recorded the watermark information embedding program of 18 claim 13 thru/or given in any 1 term and in which computer reading is possible can be offered.
[0045]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[0046] Drawing 1 is a block diagram showing the configuration of the watermark information embedding equipment 100 concerning 1 operation gestalt of this invention. The watermark information embedding equipment 100 shown in this drawing The sound generated at the time of a performance An electrical signal The sound input section 1 changed into a (analog signal), the A/D-conversion section 3 which digitizes the analog signal inputted from this sound input section 1, the former data accumulation section 5 which memorizes temporarily the digital signal digitized in the A/D-conversion section 3 for every time interval set up beforehand, To said digital signal, digital watermarking The watermark embedding operation part 7 to embed, the data accumulation section 9 containing a watermark which memorizes temporarily the digital signal with which digital watermarking was embedded, the D/A transducer 11 which spaces and changes an entering digital signal into an analog signal, and the analog signal containing a watermark are changed into a sound. It has the sound output section 13 to output at least.
[0047] Watermark information embedding equipment 100 has the watermark information input section 15 which sets up the time interval which divides a digital signal in the former data accumulation section 5, and the watermark information storage section 17 which memorizes digital watermarking, spaces the data and transmits to the embedding operation part 7 while inputting further digital watermarking embedded at a digital signal.

[0048] A character string is mentioned as an example of digital watermarking inputted in the watermark information input section 15. As long as this character string includes the proper information for identifying a sound, what inputted the desired character string suitably is sufficient as it, and the random number generated using the random number generator etc. is sufficient as it. When thinking the real time nature of the sound outputted as important, the direction with little amount of information of digital watermarking is more desirable. Therefore, if a sound can be specified even if it is a metaphor single character, using as digital watermarking is possible.
[0049] Moreover, the sound of a suitable frequency, for example, the sound which carries out localization to the frequency domain of extent which cannot be sensed with human being's consciousness, can be inputted from the watermark information input section 15, and this sound can also be made into digital watermarking.
[0050] The case where it has the configuration to which the body part which changes from other each part to the sound input sections 1, such as a microphone, and the sound output sections 13, such as a loudspeaker, as a gestalt of watermark information embedding equipment 100 was connected can be considered.
[0051] Moreover, it is possible to also make the configuration mentioned above to the electrohone like an electronic organ, an electric guitar, and an electronic violin itself as another gestalt of watermark information embedding equipment 100 provide. In this case, digital watermarking will be embedded and outputted to the sound performed with electrohone from the start.
[0052] In addition, the watermark information embedding equipment 100 which has the above configuration consists of computers equipped with a central processing unit, main memory, etc., and the watermark information embedding program for performing processing explained below is memorized. Moreover, this program is also recordable on the record medium which CD-ROM etc. can computer read.
[0053] Drawing 2 is an explanatory view showing the flow of processing of the watermark information embedding approach concerning this operation gestalt, and change of the signal in each processing. In this drawing, the signal Fig. in which the acoustic signal according to the step corresponding to the right-hand side of each step of a flow chart showed what kind of thing it was is given. Hereafter, it spaces using drawing 2 and the flow of processing of the watermark information embedding approach by information embedding equipment 100 is explained.
[0054] The sound emitted at the time of a performance is inputted in the sound input section 1, it changes into an electrical signal (analog signal) (step S1), and this electrical signal (analog signal) is changed into a digital signal by the A/D-conversion section 3 (step S3). Although the case (hex decimal) where it displays 4 bits of digital signals at a time collectively as an example is given in drawing 2, this operation gestalt may not be restricted to this and may be made the display by the mere binary numeral (010011 ...).
[0055] At the following step S5, the above-mentioned digital signal is serially accumulated in the constant-rate [every] former data accumulation section 5. In the case of are recording here, with the time interval (T of drawing 2) beforehand set up by the watermark information input section 15, a digital signal is divided and it accumulates a constant rate every serially. Although the case where a digital signal is divided into every 9 figure (36 bits) is expressed with the example of drawing 2 , of course, this is only an example to the last.
[0056] Although the value of a time interval T can be adjusted suitably, it is desirable to set up the value of extent which human being cannot perceive time difference, i.e., the value of extent which does not spoil real time nature.
[0057] After embedding digital-watermarking information by the watermark embedding operation part 7 at the digital signal of the former data stored at step S5 (step S7), it memorizes temporarily in the watermark close data accumulation section 9.
[0058] After digital watermarking by the watermark embedding operation part 7 embedding, and changing suitably digital watermarking which developed the digital signal by the fast Fourier transform (or discrete cosine transform), for example, changed into the frequency component as a direction, spaced through the specific frequency component of these, and was memorized in

the information storage section 17 and embedding it, there is a method of returning to a digital signal by the reverse fast Fourier transform (or reverse discrete cosine transform).
[0059] Moreover, besides what was mentioned above, wavelet transform may be used, and you may change into a frequency component, and may also embed digital watermarking.
[0060] Furthermore, it is also possible to carry out spectrum diffusion and to embed at each frequency component of the digital signal which generated the random number based on normal distribution, and was changed by the operation of one of the above by making this random number into digital watermarking.
[0061] In addition, as for digital watermarking used with the watermark information embedding equipment 100 concerning this operation gestalt, it is desirable to mainly be embedded into the redundancy part which is not human being's consciousness overlay important point in the generated sound, and not to perceive the digital watermarking as a noise after an output. Therefore, it is more desirable to set up so that it may increase relatively compared with the amount of digital watermarking which embeds the amount of digital watermarking embedded into a redundancy part into the main frequency part which human being can perceive by the watermark embedding operation part 7.
[0062] The signal Fig. shown after step S9 of drawing 2 shows the case where a part of character string receives modification, as a result of digital watermarking's being embedded by a certain operation mentioned above. the result by which digital watermarking was more specifically embedded at the digital signal "17DF7AC7B" in the first time interval T — "A" of "7" and the left of the left to the double figures to the 6th figure — a value "8" respectively big [every / 1] and "B" — changing — "B" of the left to the 9th (digit of most right end) figure — 1 — it is changing to the small value "A." Also about future time intervals, the value for triple figures is increasing or decreasing every [1] among 9 figures, respectively.
[0063] After that, by the D/A transducer 11, the digital signal containing a watermark with which digital watermarking was embedded is changed into an analog signal (step S11), and is outputted as a sound containing digital watermarking from the sound output section 13 (step S13).
[0064] What embedded digital watermarking in the performed sound can be outputted on real time as a result of the above processing.
[0065] According to 1 operation gestalt of this invention mentioned above, the digital signal which digitized the inputted sound is accumulated a constant rate every serially, and it becomes possible by embedding digital watermarking for every constant rate of this to output the sound containing digital watermarking to coincidence mostly with generating of the original sound.
[0066] Moreover, according to this operation gestalt, right information, such as copyright concerning the music content, can be specified by carrying out unjust sound recording at the time of a live performance, and analyzing digital watermarking embedded to the music content distributed through the Internet etc.
[0067] Furthermore, according to this operation gestalt, digital watermarking is already contained in the sound performed at the time before concert initiation, and the effectiveness which controls unjust sound recording can be expected by notifying of the purport punished on the Copyright Act, when the contents recorded unjustly are exhibited by the Internet.
[0068] In addition, in 1 operation gestalt of this invention mentioned above, although the case where digital watermarking was equally embedded to all the digital signals that were set up beforehand and that were divided for every time interval was explained, this invention does not do effectiveness peculiar to a limitation so to how to embed such digital watermarking.
[0069] Hereafter, as a modification of this operation gestalt, it spaces and the same digital watermarking as the information embedding approach is spaced, it inputs from the information input section 15, and the case where the time interval which divides the digitized signal which was mentioned above is also set as the value of the same T is explained.
[0070] Drawing 3 is an explanatory view in case how to embed digital watermarking of each divided time interval differs periodically. In this drawing, the configuration of watermark information embedding equipment is the same as drawing 1 , and the flow of processing of the watermark information embedding equipment is the same as drawing 2 .
[0071] Although the point which embeds digital watermarking one by one in the time zone divided

with the time interval T is the same as that of drawing 2 when shown in drawing 3 , in drawing 2 , only the signal for a single figure is changed with each time interval to the signal for triple figures having been changed with one time interval here. namely, — digital watermarking — embedding — having had — a result — the — one — a time zone — **** — the left — from — two — a figure — ** — only — (— "— seven — " — -> — "— eight — " —) — the — two — a time zone — **** — the left — from — six — a figure — ** — only — (— "— F — " — -> — "— E — " —) — the — three — a time zone — **** — the left — from — eight — a figure — ** — only — (— "— E — " — -> — "— F — " —) — respectively — a value — modification — winning popularity — **** . Thus, in case digital watermarking of the same amount of data as drawing 2 was embedded, because the information beforehand embedded as digital watermarking by the watermark embedding operation part 7 was divided and each of that divided part was embedded one by one, it decreased rather than the case where the digit count changed with each time interval shows drawing 2 .

[0072] Temporarily, by the 3rd time zone, supposing the whole of each part divided from the information embedded as digital watermarking is embedded, like the 1st thru/or the 3rd time zone, said each part is embedded one by one, and it will be henceforth embedded periodically one by one considering three time zones as one period after the 4th time zone.

[0073] In addition, it cannot be overemphasized that the explanatory view shown in drawing 3 expresses an example in the case of embedding periodically digital watermarking divided beforehand one by one.

[0074] Drawing 4 is an explanatory view showing the flow of processing at the time of setting up so that the time zone which embeds digital watermarking, and the time zone which is not embedded may come by turns, and the situation of change of a signal. Also in this drawing, the flow of the configuration of watermark information embedding equipment and processing is the same as drawing 1 and drawing 2 respectively.

[0075] when shown in drawing 4 , in the 1st time zone, digital watermarking is embedded like drawing 2 — **** (3 and the value of the 6 or 9th figure are one increment or reduction from the left) — digital watermarking is not embedded in the 2nd time zone. Henceforth, a signal without entering digital watermarking and digital watermarking comes to come by turns. In addition, it can also set up so that the time zone which embeds digital watermarking may become random.

[0076] Moreover, of course, it is also possible to make it digital watermarking to embed change periodically, after setting up suitably the time zone which embeds digital watermarking after dividing a digital signal into a suitable time interval by combining how embedding digital watermarking shown in drawing 3 and drawing 4 .

[0077] According to the modification of 1 operation gestalt of this invention explained using drawing 3 and drawing 4 , it cannot be overemphasized that the same effectiveness as the above-mentioned operation gestalt is acquired.

[0078] In addition, especially the thing that the modification mentioned above makes the same digital watermarking and the time interval T to divide, and delay produces in actuation of a musical instrument and the sound which are outputted like [since there is little amount of data of digital watermarking embedded in each time zone divided as compared with the case where it is shown in drawing 2 and it ends] the concert held at the small hall of a scale etc. is not allowed, but does bigger effectiveness so to the case want to think real-time nature as important as much as possible etc.

[0079] As stated above, in this invention, the amount of data of digital watermarking embedded in the time interval T which divides a digital signal, and each time zone can be adjusted to the optimal thing each time according to a scale, a performance gestalt, etc. in the performance hall.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the watermark information embedding equipment concerning 1 operation gestalt of this invention.
[Drawing 2] It is the explanatory view showing the flow of the processing in the watermark information embedding equipment concerning 1 operation gestalt of this invention, and an example of change of a signal according to each processing.
[Drawing 3] It is the explanatory view showing the 2nd example of change of a signal according to the flow of processing and each processing in the watermark information embedding equipment concerning 1 operation gestalt of this invention.
[Drawing 4] It is the explanatory view showing the 3rd example of change of a signal according to the flow of processing and each processing in the watermark information embedding equipment concerning 1 operation gestalt of this invention.
[Description of Notations]
1 Sound Input Section (Sound Input Means)
3 A/D-Conversion Section (Digitization Means)
5 Former Data Accumulation Section (Former Data Accumulation Means)
7 Watermark Embedding Operation Part (Watermark Embedding Operation Means)
9 Space and it is Entering Data Accumulation Section (Spacing Entering Data Accumulation Means).
11 D/A Transducer (Analog-ized Means)
13 Sound Output Section (Sound Output Means)
15 Watermark Information Input Section (Watermark Information Input Means)
17 Watermark Information Storage Section (Watermark Information Storage Means)
100 Watermark Information Embedding Equipment

[Translation done.]

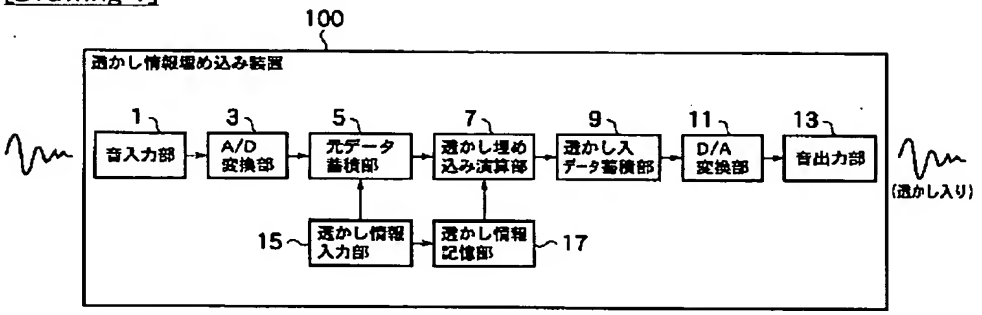
* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

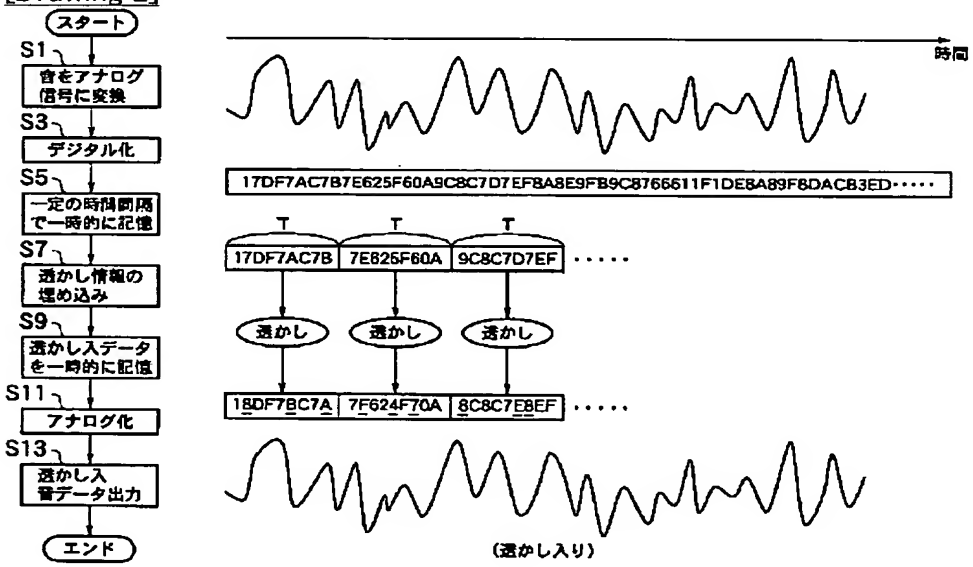
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

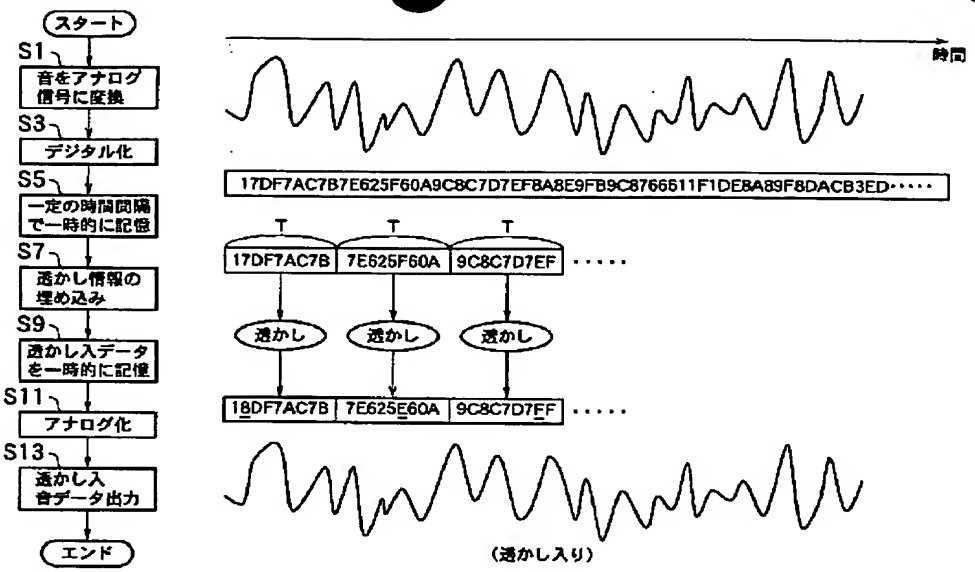
[Drawing 1]



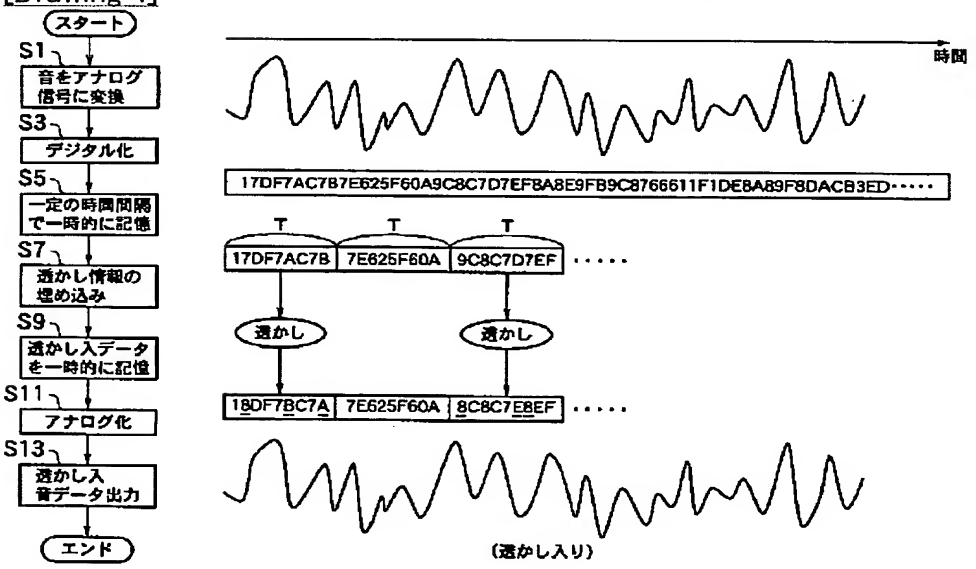
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2003－263182
（P2003－263182A）
(43)公開日　平成15年９月19日(2003.9.19)

(51)Int.Cl.'	識別記号	ＦＩ		テーマコード'（参考）
Ｇ１０Ｌ　11/00		Ｇ０９Ｃ　5/00		５Ｊ１０４
Ｇ０９Ｃ　5/00		Ｇ１０Ｋ　15/02		
Ｇ１０Ｋ　15/02		Ｇ１０Ｌ　9/00	Ｅ	

審査請求　未請求　請求項の数19　ＯＬ　（全 10 頁）

(21)出願番号　特願2002－62556(P2002－62556)

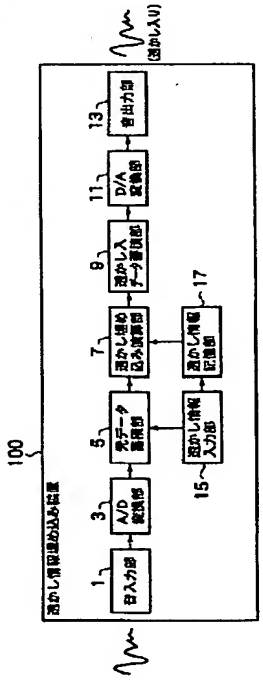
(22)出願日　平成14年３月７日(2002.3.7)

(71)出願人　399040405
東日本電信電話株式会社
東京都新宿区西新宿三丁目19番２号
(72)発明者　井藤　晴久
東京都新宿区西新宿三丁目19番２号　東日本電信電話株式会社内
(74)代理人　100083806
弁理士　三好　秀和　（外４名）

Ｆターム(参考)　5J104 AA13 AA14

(54)【発明の名称】　透かし情報埋め込み方法、透かし情報埋め込み装置、透かし情報埋め込みプログラムおよび当該プログラムを記録したコンピュータ読み取り可能な記録媒体

(57)【要約】
【課題】　入力された音に電子透かし情報を埋め込むと同時に、その電子透かし情報が埋め込まれた音を出力することのできる透かし情報埋め込み方法、透かし情報埋め込み装置、透かし情報埋め込みプログラムおよび当該プログラムを記録したコンピュータ読み取り可能な記録媒体を提供する。
【解決手段】　入力された音響信号をデジタル信号に変換し、このデジタル信号を予め設定された時間間隔で分割後一時的に記憶して、前記時間間隔ごとに分割されたデジタル信号に所定の演算を施して予め記憶している電子透かし情報を埋め込んだ後、電子透かし情報が埋め込まれた透かし入りデジタル信号を音に変換して出力する。



1

【特許請求の範囲】

【請求項１】　音に電子透かし情報を埋め込むときの透かし情報埋め込み方法であって、コンピュータが、
入力された音をデジタル化してデジタル信号を生成し、
このデジタル信号に対して予め設定された時間間隔ごとに順次電子透かし情報を埋め込むことを特徴とする透かし情報埋め込み方法。

【請求項２】　音に電子透かし情報を埋め込むときの透かし情報埋め込み方法であって、コンピュータが、
入力された音に関する情報をアナログ信号に変換するステップと、
前記アナログ信号をデジタル信号に変換するステップと、
前記デジタル信号を予め設定された時間間隔ごとに一時的に記憶するステップと、
前記時間間隔ごとに分割されたデジタル信号に所定の演算を施して予め記憶している電子透かし情報を埋め込むステップと、
前記電子透かし情報が埋め込まれた透かし入りデジタル信号を一時的に記憶するステップと、
前記透かし入りデジタル信号を透かし入りアナログ信号に変換するステップと、
前記透かし入りアナログ信号を音に変換して出力するステップとを実行することを特徴とする透かし情報埋め込み方法。

【請求項３】　前記電子透かし情報は、前記時間間隔ごとに分割された各時間帯のデジタル信号に対して順次均等に埋め込まれることを特徴とする請求項１または２記載の透かし情報埋め込み方法。

【請求項４】　複数の部分に分割された前記電子透かし情報が、前記時間間隔ごとに分割された各時間帯のデジタル信号に対して順次周期的に埋め込まれることを特徴とする請求項１または２記載の透かし情報埋め込み方法。

【請求項５】　前記電子透かし情報は、前記時間間隔ごとに分割された各時間帯のデジタル信号に対して断続的に埋め込まれることを特徴とする請求項１または２記載の透かし情報埋め込み方法。

【請求項６】　前記電子透かし情報は一つまたは複数の文字から成ることを特徴とする請求項１乃至５のいずれか一項記載の透かし情報埋め込み方法。

【請求項７】　音に電子透かし情報を埋め込むときの透かし情報埋め込み装置であって、
入力された音をデジタル化してデジタル信号を生成するデジタル化手段と、
前記デジタル信号に対して予め設定された時間間隔ごとに順次電子透かし情報を埋め込む透かし埋め込み演算手段とを備えたことを特徴とする透かし情報埋め込み装置。

【請求項８】　音に電子透かし情報を埋め込む透かし情報埋め込み装置であって、
入力された音に関する情報をアナログ信号に変換する音入力手段と、
前記アナログ信号をデジタル信号に変換するデジタル化手段と、
前記デジタル信号を予め設定された時間間隔で分割して一時的に記憶する元データ蓄積手段と、
前記電子透かし情報を入力する透かし情報入力手段と、
前記透かし情報入力手段で入力された前記電子透かし情報を記憶する透かし情報記憶手段と、
前記透かし情報記憶手段に記憶された前記電子透かし情報を前記時間間隔ごとに分割されたデジタル信号に対して所定の演算によって埋め込む透かし埋め込み演算手段と、
前記電子透かし情報が埋め込まれた透かし入りデジタル信号を一時的に記憶する透かし入りデータ蓄積手段と、
前記透かし入りデジタル信号を透かし入りアナログ信号に変換するアナログ化手段と、
前記透かし入りアナログ信号を音に変換して出力する音出力手段とを備えたことを特徴とする透かし情報埋め込み装置。

【請求項９】　前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔に分割された各時間帯のデジタル信号に対して順次均等に埋め込むことを特徴とする請求項７または８記載の透かし情報埋め込み装置。

【請求項１０】　前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出して複数の部分に分割し、この分割した電子透かし情報の各部分を前記時間間隔で分割された各時間帯のデジタル信号に対して順次周期的に埋め込むことを特徴とする請求項７または８記載の透かし情報埋め込み装置。

【請求項１１】　前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔ごとに分割された各時間帯のデジタル信号に対して断続的に埋め込むことを特徴とする請求項７または８記載の透かし情報埋め込み装置。

【請求項１２】　前記電子透かし情報は一つまたは複数の文字から成ることを特徴とする請求項７乃至１１のいずれか一項記載の透かし情報埋め込み装置。

【請求項１３】　音に電子透かし情報を埋め込むためにコンピュータを、
入力された音をデジタル化してデジタル信号を生成するデジタル化手段、
前記デジタル信号に対して予め設定された時間間隔ごとに順次電子透かし情報を埋め込む透かし埋め込み演算手段、として機能させることを特徴とする透かし情報埋め込みプログラム。

【請求項１４】　音に電子透かし情報を埋め込むためにコンピュータを、
入力された音に関する情報をアナログ信号に変換する音入力手段、
前記アナログ信号をデジタル信号に変換するデジタル化手段、
前記デジタル信号を予め設定された時間間隔で分割して一時的に記憶する元データ蓄積手段、
前記電子透かし情報を入力する透かし情報入力手段、
前記透かし情報入力手段で入力された前記電子透かし情報を記憶する透かし情報記憶手段、
前記透かし情報記憶手段に記憶された前記電子透かし情報を前記時間間隔ごとに分割されたデジタル信号に対して所定の演算によって埋め込む透かし埋め込み演算手段、
前記電子透かし情報が埋め込まれた透かし入りデジタル信号を一時的に記憶する透かし入りデータ蓄積手段、
前記透かし入りデジタル信号を透かし入りアナログ信号に変換するアナログ化手段、
前記透かし入りアナログ信号を音に変換して出力する音出力手段、として機能させることを特徴とする透かし情報埋め込みプログラム。

【請求項１５】　前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔に分割された各時間帯のデジタル信号に対して順次均等に埋め込むことを特徴とする請求項１３または１４記載の透かし情報埋め込みプログラム。

【請求項１６】　前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出して複数の部分に分割し、この分割した電子透かし情報の各部分を前記時間間隔で分割された各時間帯のデジタル信号に対して順次周期的に埋め込むことを特徴とする請求項１３または１４記載の透かし情報埋め込みプログラム。

【請求項１７】　前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔ごとに分割された各時間帯のデジタル信号に対して断続的に埋め込むことを特徴とする請求項１３または１４記載の透かし情報埋め込みプログラム。

【請求項１８】　前記電子透かし情報は一つまたは複数の文字から成ることを特徴とする請求項１３乃至１７のいずれか一項記載の透かし情報埋め込みプログラム。

【請求項１９】　請求項１３乃至１８のいずれか一項記載の透かし情報埋め込みプログラムを記録したことを特徴とする透かし情報埋め込みプログラムを記録したコンピュータ読み取り可能な記録媒体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、音に電子透かし情報を埋め込む透かし情報埋め込み方法、透かし情報埋め込み装置、透かし情報埋め込みプログラムおよび当該プログラムを記録したコンピュータ読み取り可能な記録媒体に関する。

【０００２】

【従来の技術】従来、インターネットを介して配信される音楽コンテンツに電子透かし情報（以後、単に「電子透かし」と称することもある）を埋め込み、その音楽コンテンツに係る著作権や著作隣接権等の権利の所有者を明らかにすることができる技術が開示されている。

【０００３】

【発明が解決しようとする課題】しかしながら、上述した従来技術は、予めディスクやメモリ等のデータを記憶する手段に格納されたファイルに対してオフライン処理されるため、コンサート等でのライブ演奏時のように、演奏と同時にリアルタイムで電子透かしを埋め込みたい場合に適用することができなかった。

【０００４】このため、コンサート会場等では著作権や演奏者の著作隣接権を守るために録音機器の持込を禁止しているにもかかわらず、ライブ演奏時に不正に録音され、インターネット等を介して配信される演奏音に対しては打つ手がないのが現状であった。

【０００５】本発明は上記に鑑みてなされたものであり、その目的は、入力された音に電子透かし情報を埋め込むと同時に、その電子透かし情報が埋め込まれた音を出力することのできる透かし情報埋め込み方法、透かし情報埋め込み装置、透かし情報埋め込みプログラムおよび当該プログラムを記録したコンピュータ読み取り可能な記録媒体を提供することにある。

【０００６】

【課題を解決するための手段】上記目的を達成するために、請求項１記載の本発明は、音に電子透かし情報を埋め込むときの透かし情報埋め込み方法であって、コンピュータが、入力された音をデジタル化してデジタル信号を生成し、このデジタル信号に対して予め設定された時間間隔ごとに順次電子透かし情報を埋め込むことを要旨とする。

【０００７】請求項１記載の本発明によれば、入力された音をデジタル化したデジタル信号に対して予め設定された時間間隔ごとに順次電子透かしを埋め込むことにより、リアルタイムで電子透かしを埋め込むことが可能になる。

【０００８】請求項２記載の本発明は、音に電子透かし情報を埋め込むときの透かし情報埋め込み方法であって、コンピュータが、入力された音に関する情報をアナログ信号に変換するステップと、前記アナログ信号をデジタル信号に変換するステップと、前記デジタル信号を予め設定された時間間隔で分割して一時的に記憶するステップと、前記時間間隔ごとに分割されたデジタル信号

に所定の演算を施して予め記憶している電子透かし情報を埋め込むステップと、前記電子透かし情報が埋め込まれた透かし入りデジタル信号を一時的に記憶するステップと、前記透かし入りデジタル信号を透かし入りアナログ信号に変換するステップと、前記透かし入りアナログ信号を音に変換して出力するステップとを実行することを要旨とする。

【０００９】請求項２記載の本発明によれば、コンピュータが、入力された音をデジタル信号に変換し、このデジタル信号を予め設定された時間間隔で分割後一時的に記憶して、前記時間間隔ごとに分割されたデジタル信号に所定の演算を施して予め記憶している電子透かしを埋め込んだ後、その電子透かしが埋め込まれた透かし入りデジタル信号を音に変換して出力することにより、入力された音にリアルタイムで電子透かしを埋め込んで出力することが可能になる。

【００１０】請求項３記載の本発明は、前記電子透かし情報は、前記時間間隔ごとに分割された各時間帯のデジタル信号に対して順次均等に埋め込まれることを要旨とする。

【００１１】請求項３記載の本発明によれば、電子透かしを分割されたデジタル信号の各部分に対して順次均等に埋め込むことで音発生時とほとんど時間差なく電子透かし入りの音を出力することができる。

【００１２】請求項４記載の本発明は、複数の部分に分割された前記電子透かし情報が、前記時間間隔ごとに分割された各時間帯のデジタル信号に対して順次周期的に埋め込まれることを要旨とする。

【００１３】請求項４記載の本発明によれば、電子透かしとして埋め込む情報を複数の部分に分割し、この分割された各部分を分割されたデジタル信号に対して順次周期的に埋め込むことで、音発生時とほとんど時間差なく電子透かし入りの音を出力することができる。

【００１４】請求項５記載の本発明は、前記電子透かし情報は、前記時間間隔ごとに分割された各時間帯のデジタル信号に対して断続的に埋め込まれることを要旨とする。

【００１５】請求項５記載の本発明によれば、電子透かし情報を埋め込む時間帯と埋め込まない時間帯を断続的に設けることにより、音発生時とほとんど時間差なく電子透かし入りの音を出力することができる。

【００１６】請求項６記載の本発明は、前記電子透かし情報は一つまたは複数の文字から成ることを要旨とする。

【００１７】請求項６記載の本発明によれば、電子透かしとして文字列を用い、この文字列を適宜変換してデジタル信号に埋め込むことができる。

【００１８】請求項７記載の本発明は、音に電子透かし情報を埋め込むときの透かし情報埋め込み装置であって、入力された音をデジタル化してデジタル信号を生成するデジタル化手段と、前記デジタル信号に対して予め設定された時間間隔ごとに順次電子透かし情報を埋め込む透かし埋め込み演算手段とを備えたことを要旨とする。

【００１９】請求項７記載の本発明によれば、入力された音をデジタル化したデジタル信号に対して予め設定された時間間隔ごとに順次電子透かしを埋め込むことにより、リアルタイムで電子透かしを埋め込むことが可能になる。

【００２０】請求項８記載の本発明は、音に電子透かし情報を埋め込む透かし情報埋め込み装置であって、入力された音に関する情報をアナログ信号に変換する音入力手段と、前記アナログ信号をデジタル信号に変換するデジタル化手段と、前記デジタル信号を予め設定された時間間隔で分割して一時的に記憶する元データ蓄積手段と、前記電子透かし情報を入力する透かし情報入力手段と、前記透かし情報入力手段で入力された前記電子透かし情報を記憶する透かし情報記憶手段と、前記透かし情報記憶手段に記憶された前記電子透かし情報を前記時間間隔ごとに分割されたデジタル信号に対して所定の演算によって埋め込む透かし埋め込み演算手段と、前記電子透かし情報が埋め込まれた透かし入りデジタル信号を一時的に記憶する透かし入りデータ蓄積手段と、前記透かし入りデジタル信号を透かし入りアナログ信号に変換するアナログ化手段と、前記透かし入りアナログ信号を音に変換して出力する音出力手段とを備えたことを要旨とする。

【００２１】請求項８記載の本発明によれば、入力された音をデジタル信号に変換し、このデジタル信号を予め設定された時間間隔で分割後一時的に記憶して、前記時間間隔ごとに分割されたデジタル信号に所定の演算を施して予め記憶している電子透かしを埋め込んだ後、電子透かしが埋め込まれた透かし入りデジタル信号を音に変換して出力することにより、入力された音にリアルタイムで電子透かしを埋め込んで出力することのできる透かし情報埋め込み装置を提供することができる。

【００２２】請求項９記載の本発明は、前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔に分割された各時間帯のデジタル信号に対して順次均等に埋め込むことを要旨とする。

【００２３】請求項９記載の本発明によれば、分割されたデジタル信号の各部分に対し、透かし埋め込み演算手段によって電子透かしを均等に埋め込むことで音発生時とほとんど時間差なく電子透かし入りの音を出力することができる。

【００２４】請求項１０記載の本発明は、前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出して複数の部分に分割し、この分割した電子透かし情報の各部分を前記時間間隔で分

割された各時間帯のデジタル信号に対して順次周期的に埋め込むことを要旨とする。

【００２５】請求項１０記載の本発明によれば、透かし情報埋め込み演算手段を用いて電子透かしとして埋め込む情報を複数の部分に分割し、この分割された各部分を分割されたデジタル信号に順次周期的に埋め込むことで、音発生時とほとんど時間差なく電子透かし入りの音を出力することができる。

【００２６】請求項１１記載の本発明は、前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔ごとに分割された各時間帯のデジタル信号に対して断続的に埋め込むことを要旨とする。

【００２７】請求項１１記載の本発明によれば、電子透かし情報を埋め込む時間帯と埋め込まない時間帯を断続的に設けることにより、音発生時とほとんど時間差なく電子透かし入りの音を出力することができる。

【００２８】請求項１２記載の本発明は、前記電子透かし情報が一つまたは複数の文字から成ることを要旨とする。

【００２９】請求項１２記載の本発明によれば、電子透かしとして文字列を用い、この文字列を適宜変換してデジタル信号に埋め込むことができる。

【００３０】以下、請求項１３乃至１８記載の本発明は、音に電子透かしを埋め込む透かし情報埋め込み方法をコンピュータに実行させるための透かし情報埋め込みプログラムを提供するものである。

【００３１】請求項１３記載の本発明は、音に電子透かし情報を埋め込むためにコンピュータを、入力された音をデジタル化してデジタル信号を生成するデジタル化手段、前記デジタル信号に対して予め設定された時間間隔ごとに順次電子透かし情報を埋め込む透かし埋め込み演算手段、として機能させることを要旨とする。

【００３２】請求項１３記載の本発明によれば、入力された音をデジタル化したデジタル信号に対して予め設定された時間間隔ごとに順次電子透かしを埋め込むことにより、リアルタイムで電子透かしを埋め込むことを可能にする透かし情報埋め込みプログラムを提供することができる。

【００３３】請求項１４記載の本発明は、音に電子透かし情報を埋め込むためにコンピュータを、入力された音に関する情報をアナログ信号に変換する音入力手段、前記アナログ信号をデジタル信号に変換するデジタル化手段、前記デジタル信号を予め設定された時間間隔で分割して一時的に記憶する元データ蓄積手段、前記電子透かし情報を入力する透かし情報入力手段、前記透かし情報入力手段で入力された前記電子透かし情報を記憶する透かし情報記憶手段、前記透かし情報記憶手段に記憶された前記電子透かし情報を前記時間間隔ごとに分割されたデジタル信号に対して所定の演算によって埋め込む透かし埋め込み演算手段、前記電子透かし情報が埋め込まれた透かし入りデジタル信号を一時的に記憶する透かし入りデータ蓄積手段、前記透かし入りデジタル信号を透かし入りアナログ信号に変換するアナログ化手段、前記透かし入りアナログ信号を音に変換して出力する音出力手段、として機能させることを要旨とする。

【００３４】請求項１４記載の本発明によれば、入力された音をデジタル信号に変換し、このデジタル信号を予め設定された時間間隔で分割後一時的に記憶して、前記時間間隔ごとに分割されたデジタル信号に所定の演算を施して予め記憶している電子透かしを埋め込んだ後、その電子透かしが埋め込まれた透かし入りデジタル信号を音に変換して出力することにより、入力された音にリアルタイムで電子透かしを埋め込んで出力することのできる透かし情報埋め込みプログラムを提供することができる。

【００３５】請求項１５記載の本発明は、前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔に分割された各時間帯のデジタル信号に対して順次均等に埋め込むことを要旨とする。

【００３６】請求項１５記載の本発明によれば、分割されたデジタル信号の各部分に対して電子透かしを順次均等に埋め込むことで、音発生時とほとんど時間差なく電子透かし入りの音を出力するプログラムを提供することができる。

【００３７】請求項１６記載の本発明は、前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出して複数の部分に分割し、この分割した電子透かし情報の各部分を前記時間間隔で分割された各時間帯のデジタル信号に対して順次周期的に埋め込むことを要旨とする。

【００３８】請求項１６記載の本発明によれば、電子透かしとして埋め込む情報を複数の部分に分割し、この分割された各部分を分割されたデジタル信号に順次周期的に埋め込むことで、音発生時とほとんど時間差なく電子透かし入りの音を出力するプログラムを提供することができる。

【００３９】請求項１７記載の本発明は、前記透かし埋め込み演算手段は、前記透かし情報記憶手段に記憶された電子透かし情報を読み出し、この電子透かし情報を前記時間間隔ごとに分割された各時間帯のデジタル信号に対して断続的に埋め込むことを要旨とする。

【００４０】請求項１７記載の本発明によれば、電子透かし情報を埋め込む時間帯と埋め込まない時間帯を断続的に設けることにより、音発生時とほとんど時間差なく電子透かし入りの音を出力するプログラムを提供することができる。

【００４１】請求項１８記載の本発明は、前記電子透かし情報は一つまたは複数の文字から成ることを要旨とす

る。

【００４２】請求項１８記載の本発明によれば、電子透かしとして文字列を用い、この文字列を適宜変換してデジタル信号に埋め込むプログラムを提供することができる。

【００４３】請求項１９記載の本発明は、請求項１３乃至１８のいずれか一項記載の透かし情報埋め込みプログラムを記録したことを要旨とする。

【００４４】請求項１９記載の本発明によれば、請求項１３乃至１８のいずれか一項記載の透かし情報埋め込みプログラムを記録したコンピュータ読み取り可能な記録媒体を提供することができる。

【００４５】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態を説明する。

【００４６】図１は、本発明の一実施形態に係る透かし情報埋め込み装置１００の構成を表すブロック図である。同図に示す透かし情報埋め込み装置１００は、演奏時に発生する音を電気信号（アナログ信号）に変換する音入力部１、この音入力部１から入力されたアナログ信号をデジタル化するＡ／Ｄ変換部３、Ａ／Ｄ変換部３でデジタル化されたデジタル信号を予め設定された時間間隔ごとに一時的に記憶する元データ蓄積部５、前記デジタル信号に電子透かしを埋め込む透かし埋め込み演算部７、電子透かしが埋め込まれたデジタル信号を一時的に記憶する透かし入りデータ蓄積部９、透かし入りデジタル信号をアナログ信号に変換するＤ／Ａ変換部１１、透かし入りアナログ信号を音に変換して出力する音出力部１３を少なくとも有する。

【００４７】透かし情報埋め込み装置１００はさらに、デジタル信号に埋め込む電子透かしを入力するとともに、元データ蓄積部５においてデジタル信号を分割する時間間隔を設定する透かし情報入力部１５と、電子透かしを記憶してそのデータを透かし埋め込み演算部７に送信する透かし情報記憶部１７とを有する。

【００４８】透かし情報入力部１５で入力される電子透かしの一例としては文字列が挙げられる。この文字列は、音を識別するための固有情報を含むものであれば、適宜所望の文字列を入力したものでもよいし、乱数発生器等を用いて発生させた乱数でもよい。出力される音のリアルタイム性を重視する上では、電子透かしの情報量が少ない方がより好ましい。したがって、例え一文字であっても音が特定できるものであれば電子透かしとして用いることは可能である。

【００４９】また、透かし情報入力部１５から適当な周波数の音、例えば人間の知覚では感知できない程度の周波数領域に局在する音を入力し、この音を電子透かしとすることもできる。

【００５０】透かし情報埋め込み装置１００の形態としては、マイク等の音入力部１とスピーカ等の音出力部１３とにそれ以外の各部から成る本体部分が接続された構成を有する場合が考えられる。

【００５１】また、透かし情報埋め込み装置１００の別な形態としては、エレクトーン、エレキギタ、電子バイオリンのような電子楽器そのものに上述した構成を具備させることも可能である。この場合には、電子楽器で演奏される音に初めから電子透かしが埋め込まれて出力されることになる。

【００５２】なお、以上の構成を有する透かし情報埋め込み装置１００は、中央処理装置やメインメモリ等を備えたコンピュータから構成され、以下に説明する処理を実行するための透かし情報埋め込みプログラムが記憶されている。また、このプログラムはＣＤ－ＲＯＭ等のコンピュータ読み取り可能な記録媒体に記録することもできる。

【００５３】図２は、本実施形態に係る透かし情報埋め込み方法の処理の流れと各処理における信号の変化を表す説明図である。同図においては、フローチャートの各ステップの右側に、対応するステップに応じた音響信号がどのようなものかを示した信号図が付与されている。以下、図２を用いて透かし情報埋め込み装置１００による透かし情報埋め込み方法の処理の流れを説明する。

【００５４】演奏時に発せられた音を音入力部１で入力して電気信号（アナログ信号）に変換し（ステップＳ１）、この電気信号（アナログ信号）をＡ／Ｄ変換部３によりデジタル信号に変換する（ステップＳ３）。図２では、一例としてデジタル信号を４ビットずつまとめて表示する場合（１６進法）を与えているが、本実施形態はこれに限るものではなく、単なる２進数表示（０１００１１・・・）による表示にしてもよい。

【００５５】次のステップＳ５では、上記デジタル信号を逐次一定量ずつ元データ蓄積部５に蓄積する。ここでの蓄積の際、予め透かし情報入力部１５によって設定された時間間隔（図２のＴ）でデジタル信号を分割し、逐次一定量ずつ蓄積する。図２の例では、デジタル信号を９桁（３６ビット）毎に分割した場合を表しているが、これがあくまで一例にすぎないことは勿論である。

【００５６】時間間隔Ｔの値は適宜調整できるが、人間が時間差を知覚できない程度の値、すなわちリアルタイム性を損なわない程度の値が設定されることが望ましい。

【００５７】ステップＳ５で蓄積された元データのデジタル信号に、透かし埋め込み演算部７によって電子透かし情報を埋め込んだ後（ステップＳ７）、透かし入データ蓄積部９で一時的に記憶する。

【００５８】透かし埋め込み演算部７による電子透かしの埋め込み方としては、例えばデジタル信号を高速フーリエ変換（または離散コサイン変換）により展開して周波数成分に変換し、このうちの特定の周波数成分に透かし情報記憶部１７で記憶された電子透かしを適宜変換し

て埋め込んだ後、逆高速フーリエ変換（または逆離散コサイン変換）でデジタル信号に戻すという方法がある。

【００５９】また、前述したもの以外にもウェーブレット変換を用いて周波数成分に変換して電子透かしを埋め込んでもよい。

【００６０】さらに、正規分布に基づいて乱数を生成し、この乱数を電子透かしとして上記いずれかの演算により変換されたデジタル信号の各周波数成分にスペクトラム拡散して埋め込むことも可能である。

【００６１】なお、本実施形態に係る透かし情報埋め込み装置１００で用いられる電子透かしは、発生された音の中で人間の知覚上重要でない冗長部分に主に埋め込まれ、出力後にその電子透かしが雑音として知覚されないことが望ましい。したがって、透かし埋め込み演算部７によって冗長部分に埋め込む電子透かしの量を、人間が知覚できる主要周波数部分に埋め込む電子透かしの量に比べて相対的に多くなるように設定しておくことがより好ましい。

【００６２】図２のステップＳ９のあとに示された信号図は、上述した何らかの演算によって電子透かしが埋め込まれた結果、文字列の一部が変更を受けた場合を示している。より具体的には、最初の時間間隔Ｔにおけるデジタル信号「１７ＤＦ７ＡＣ７Ｂ」に電子透かしが埋め込まれた結果、左から２桁目の「７」、および左から６桁目の「Ａ」がそれぞれ１ずつ大きな値「８」、および「Ｂ」に変化し、左から９桁目（一番右端の桁）の「Ｂ」が１小さな値「Ａ」に変化している。以後の時間間隔についても、９桁のうち３桁分の値がそれぞれ１ずつ増加または減少している。

【００６３】電子透かしが埋め込まれた透かし入りデジタル信号は、その後Ｄ／Ａ変換部１１でアナログ信号に変換され（ステップＳ１１）、音出力部１３から電子透かし入りの音として出力される（ステップＳ１３）。

【００６４】以上の処理の結果、演奏された音に電子透かしを埋め込んだものをリアルタイムで出力することができる。

【００６５】上述した本発明の一実施形態によれば、入力された音をデジタル化したデジタル信号を逐次一定量ずつ蓄積し、この一定量毎に電子透かしを埋め込むことで、電子透かし入りの音を元の音の発生とほぼ同時に出力することが可能になる。

【００６６】また、本実施形態によれば、ライブ演奏時に不正録音され、インターネット等を介して配信された音楽コンテンツに対しては、埋め込まれた電子透かしを解析することにより、その音楽コンテンツに係る著作権等の権利情報を特定することができる。

【００６７】さらに、本実施形態によれば、コンサート開始前の時点で、演奏される音には既に電子透かしが入っており、不正に録音した内容をインターネットによって公開した場合には著作権法上罰せられる旨の告知をすることで、不正録音を抑制する効果を期待できる。

【００６８】なお、上述した本発明の一実施形態においては、予め設定した時間間隔ごとに区切られた全てのデジタル信号に対して均等に電子透かしが埋め込まれる場合を説明したが、本発明はそのような電子透かしの埋め込み方に限り特有の効果を奏するものではない。

【００６９】以下、本実施形態の変形例として、上述した透かし情報埋め込み方法と同じ電子透かしを透かし情報入力部１５から入力し、デジタル化された信号を分割する時間間隔も同じＴの値に設定した場合について説明する。

【００７０】図３は、分割した各時間間隔の電子透かしの埋め込み方が周期的に異なる場合の説明図である。同図において、透かし情報埋め込み装置の構成は図１と同じであり、その透かし情報埋め込み装置の処理の流れは図２と同じである。

【００７１】図３に示す場合、時間間隔Ｔで分割した時間帯に順次電子透かしを埋め込む点は図２と同様であるが、図２では一つの時間間隔で３桁分の信号が変更されていたのに対し、ここでは各時間間隔で１桁分の信号のみが変更される。すなわち、電子透かしが埋め込まれた結果、第１の時間帯では左から２桁目のみ（「７」→「８」）、第２の時間帯では左から６桁目のみ（「Ｆ」→「Ｅ」）、第３の時間帯では左から８桁目のみ（「Ｅ」→「Ｆ」）がそれぞれ値の変更を受けている。このように、各時間間隔で変更される桁数が図２に示した場合よりも減少したのは、図２と同じデータ量の電子透かしを埋め込む際、透かし埋め込み演算部７で予め電子透かしとして埋め込む情報を分割し、その分割した各部分を順次埋め込んだためである。

【００７２】仮に第３の時間帯までに、電子透かしとして埋め込む情報から分割された各部分が全て埋め込まれたとすると、第４の時間帯以降は、第１乃至第３の時間帯と同様に、前記各部分が順次埋め込まれ、以後３つの時間帯を１周期として順次周期的に埋め込まれていく。

【００７３】なお、図３に示した説明図は、予め分割した電子透かしを順次周期的に埋め込む場合の一例を表したものであることはいうまでもない。

【００７４】図４は、電子透かしを埋め込む時間帯と埋め込まない時間帯が交互にくるように設定した場合の処理の流れと信号の変化の様子を表す説明図である。同図においても、透かし情報埋め込み装置の構成および処理の流れはそれぞれ図１および図２と同じである。

【００７５】図４に示す場合、第１の時間帯では図２と同様に電子透かしが埋め込まれている（左から３、６、９桁目の値が１増加または減少）が、第２の時間帯では電子透かしは埋め込まれていない。以後、電子透かし入りと電子透かしなしの信号が交互にくるようになる。なお、電子透かしを埋め込む時間帯がランダムになるように設定することもできる。

【００７６】また、図３と図４に示した電子透かしの埋め込み方を組み合わせることにより、デジタル信号を適当な時間間隔に分割後、電子透かしを埋め込む時間帯を適宜設定した上で、埋め込む電子透かしが周期的に変わるようにすることも勿論可能である。

【００７７】図３および図４を用いて説明した本発明の一実施形態の変形例によれば、上記実施形態と同様の効果が得られることはいうまでもない。

【００７８】加えて、前述した変形例は、電子透かしおよび分割する時間間隔Ｔを同じとして、図２に示した場合と比較すると、分割された各時間帯に埋め込む電子透かしのデータ量が少なくて済むため、規模の小さな会場等で行われるコンサートのように楽器の操作と出力される音に遅延が生じることが特に許されず、リアルタイム性を極力重視したい場合等に対してより大きな効果を奏する。

【００７９】以上述べたように、本発明においては、デジタル信号を分割する時間間隔Ｔおよび各時間帯に埋め込む電子透かしのデータ量を、演奏会場の規模や演奏形態等に応じてその都度最適なものに調整することができる。

【００８０】

【発明の効果】以上説明した本発明によれば、入力された音に電子透かし情報を埋め込むと同時に、その電子透かし情報が埋め込まれた音を出力することのできる透かし情報埋め込み方法、透かし情報埋め込み装置、透かし情報埋め込みプログラムおよび当該プログラムを記録したコンピュータ読み取り可能な記録媒体を提供することができる。

【００８１】また、本発明によれば、リアルタイムで演奏されている音楽コンテンツを識別する電子透かし情報を文字列として予め指定し、指定された文字列を音楽コンテンツそのものに電子透かし情報として埋め込むことができるため、不正録音された音楽コンテンツがインターネット等を通じて配信された場合には、埋め込まれた電子透かし情報を元にその音楽コンテンツに係る著作権等の権利情報を特定することができる。

【００８２】さらに、本発明によれば、コンサートに先立って上述した透かし情報埋め込み機能についての通知を行うことにより、コンサート演奏時の不正録音、および録音した音楽コンテンツの不正配信を抑止することができる。

【図面の簡単な説明】

【図１】本発明の一実施形態に係る透かし情報埋め込み装置の構成を示すブロック図である。

【図２】本発明の一実施形態に係る透かし情報埋め込み装置における処理の流れと各処理に応じた信号の変化の一例を示す説明図である。

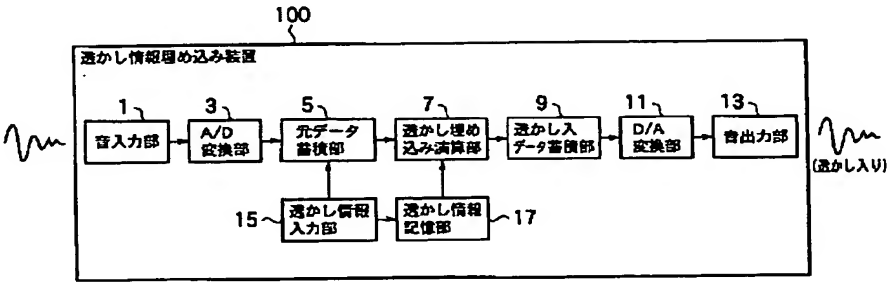
【図３】本発明の一実施形態に係る透かし情報埋め込み装置における処理の流れと各処理に応じた信号の変化の第２例を示す説明図である。

【図４】本発明の一実施形態に係る透かし情報埋め込み装置における処理の流れと各処理に応じた信号の変化の第３例を示す説明図である。

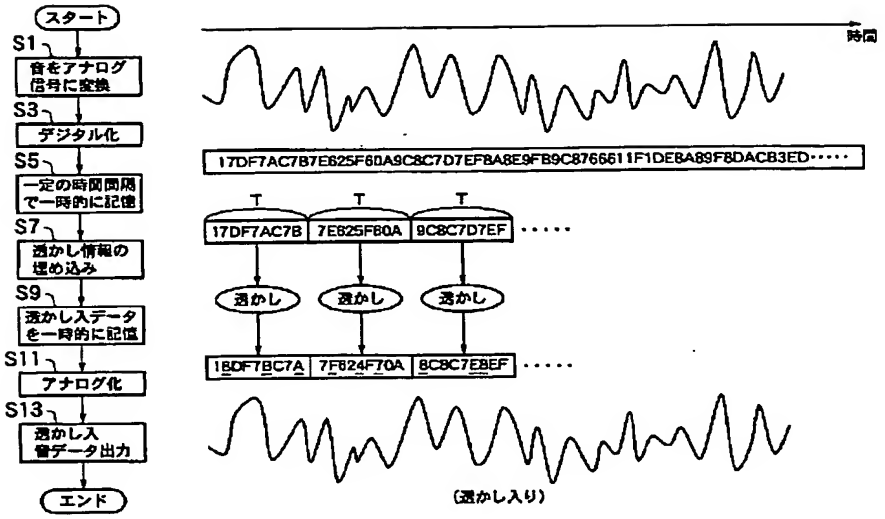
【符号の説明】

１　音入力部（音入力手段）
３　Ａ／Ｄ変換部（デジタル化手段）
５　元データ蓄積部（元データ蓄積手段）
７　透かし埋め込み演算部（透かし埋め込み演算手段）
９　透かし入りデータ蓄積部（透かし入りデータ蓄積手段）
１１　Ｄ／Ａ変換部（アナログ化手段）
１３　音出力部（音出力手段）
１５　透かし情報入力部（透かし情報入力手段）
１７　透かし情報記憶部（透かし情報記憶手段）
１００　透かし情報埋め込み装置

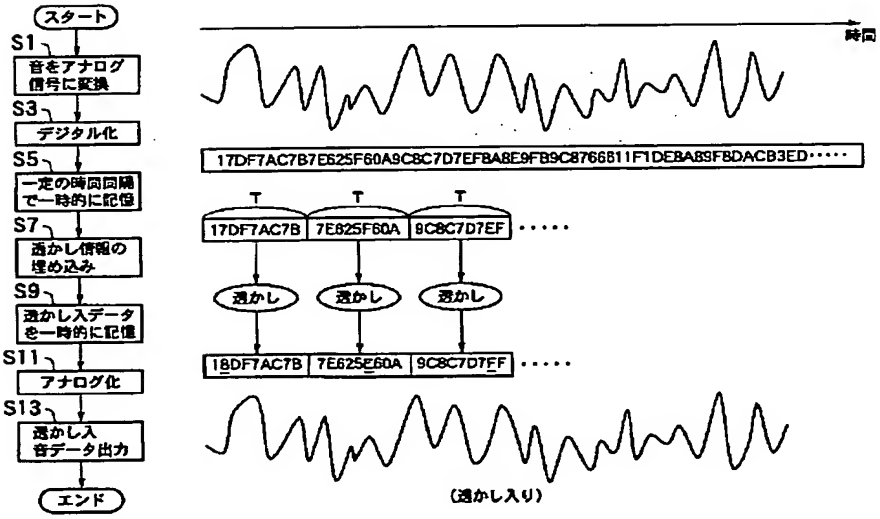
【図１】



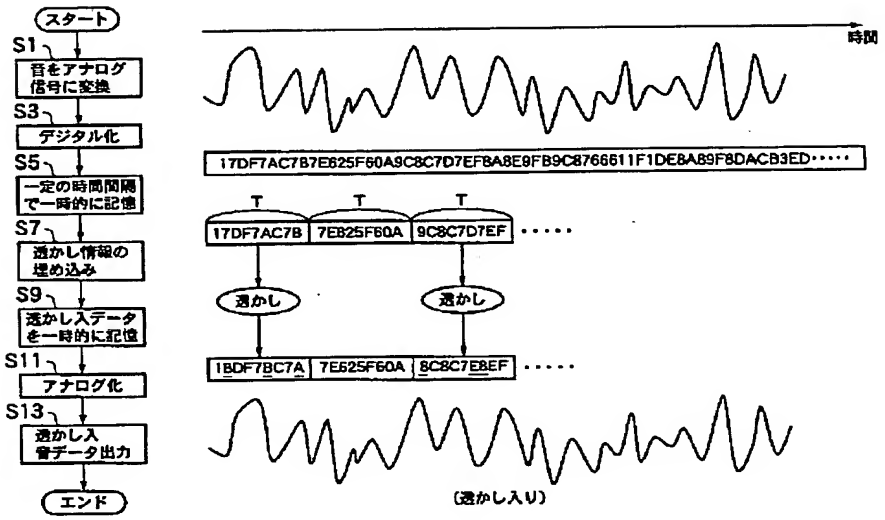
【図２】


スタート
S1
音をアナログ信号に変換
S3
デジタル化
S5
一定の時間間隔で一時的に記憶
S7
透かし情報の埋め込み
S9
透かし入データを一時的に記憶
S11
アナログ化
S13
透かし入音データ出力
エンド
時間
17DF7AC7B7E625F60A9C8C7D7EFBA8E9FB9C8766611F1DEBA89F8DACB3ED・・・・・
T
17DF7AC7B
7E625F60A
9C8C7D7EF
透かし
18DF7BC7A
7F624F70A
8C8C7E8EF
(透かし入り)

【図３】


スタート
S1
音をアナログ信号に変換
S3
デジタル化
S5
一定の時間間隔で一時的に記憶
S7
透かし情報の埋め込み
S9
透かし入データを一時的に記憶
S11
アナログ化
S13
透かし入音データ出力
エンド
時間
17DF7AC7B7E625F60A9C8C7D7EFBA8E9FB9C8766611F1DEBA89F8DACB3ED・・・・・
T
17DF7AC7B
7E625F60A
9C8C7D7EF
透かし
18DF7AC7B
7E625E60A
9C8C7D7FF
(透かし入り)

【図４】


スタート
S1
音をアナログ信号に変換
S3
デジタル化
S5
一定の時間間隔で一時的に記憶
S7
透かし情報の埋め込み
S9
透かし入データを一時的に記憶
S11
アナログ化
S13
透かし入音データ出力
エンド
時間
17DF7AC7B7E625F60A9C8C7D7EFBA8E9FB9C8766611F1DE8A89F8DACB3ED・・・・・
T
T
T
17DF7AC7B
7E625F60A
9C8C7D7EF
・・・・・
透かし
透かし
1BDF7BC7A
7E625F60A
8C8C7EBEF
・・・・・
(透かし入り)

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.